Q125 ✓

The following statement was prepared 28-FEB-75 for distribution at the Asilomar conference 2/75.

Statement concerning Safety Hazards Associated with
Research on Recombinant DNA Molecules
(Joshua Lederberg Professor of Genetics
Stanford University School of Medicine)

I believe that the following considerations must be given very careful weight as part of the formulation of policies relating to the risks and benefits of such research.

1. Without impugning the possibility of hypothetical risks connected with the release of novel biological constructions, I think it important to weigh those risks prudently against those of other laboratory, and particularly of other public health procedures, before embarking on the use of rigorous PRIOR RESTRAINT as the method of social sanction. It makes no sense to focus on research procedures for this method, when hypothetical risks of comparable or greater threat are left un-policed in such areas as:

a) The quarantine of passengers crossing national boundaries who may be carrying exotic infectious diseases (like Lassa Fever).

b) The conduct of routine infectious-disease-diagnostic microbiology on specimens from hospital patients who are already known to be ill, and who may be discovered at any time to be carrying new pathogens.

c) The cultivation of cells and tissues from human and animal sources, when these cannot be certified as being absolutely free from possible pathogens.

d) The large scale cultivation of known viruses for vaccine pro duction when we do not yet use the level of technology already available to us (as limited as this is) to certify the purity of these agents.

2. Research on Recombinant DNA is, in my opinion, the CENTRAL WAY in which molecular genetics can contribute to the solution of important medical problems, as far as can be foreseen at the present time. The aversion of risks that may be anticipated as side-effects of such research must be balanced against the human costs of the briefest delays in finding answers to pressing problems of cancer, of threats from virus infection, from genetic disease -- keep in mind what a large part of the personal tragedies of modern life are associated with these, and that to be inured to these is like having shrugged one's shoulders at tuberculosis, at scarlet fever, at pneumonia. Besides these analytical and investigative applications, the extraction of segments of human DNA, and their transplantation to microbial cell hosts , opens the door to immense opportunities for the large scale, systematic PRODUCTION of human proteins. In my view, such materials will exceed even the antibiotics in their importance for medical treatment, including many ways that we do not yet know enough to anticipate. For example, the large scale availability of purified, monospecific, human antibody globulins to various bacteria and viruses would be a revolutionary augmentation of our means to cope with infectious diseases! This is an absolute certainty; in addition there are highly persuasive roles for such materials in the prevention of cancer, of allergy, in contraception, and in many widespread "constitutional"diseases that have a definite if imperfectly understood immunological component --e.g. rheumatoid arthritis.

The use of blood fractions for the treatment of genetic diseases like hemophilia illustrates another important avenue for human protein production. Anti-hemophilia protein is indeed available today from donated human blood, but at a price that already limits its general use.

Other,comparable proteins potentially important in the treatment of genetic disease are barely available in quantities for limited research application only.

Then there are important enzymes like lysozyme, complement, urokinase, and other proteins like pituitary somatotropin, gonadotropin, etc.Besides these, there are innumerable other agents whose potential role in medicine is obscure because we do not yet have access even to the limited levels that enable research on the former.

3. In assessing the need to continue vigorous research on the molecular biology of viruses, for which DNA recombination is an invaluable tool, I believe that most people are OVEROPTIMISTIC with respect to the means we have available to forfend global epidemics comparable to the Black Death of the 14th century, (or on a lesser scale the Influenza of 1918) which took a toll of millions of lives! We have no guarantee that the natural evolutionary competition of viruses with the human species will always find ourselves the winner. We certainly know of many examples where whole species have been decimated, or even wiped out by new diseases. In our preoccupation with the risks of creating artificial diseases we may deny ourselves the tools to cope with the global, natural evolution of existing organisms. Besides the research on viruses that, as the custodians of an ever-more-crowded planet, we must look to for the keys to survival, we should also be multiplying manyfold our often piteously small investment in public health measures for global health. We must also keep in mind the paradox that a side effect of advanced hygiene and the prevention of disease is the emergence of whole populations of naive hosts, protected since childhood from the experience of life-threatening infection, and in some cases for that reason even more vulnerable to new epidemics!

4. There is little doubt, as one may read in many news accounts, of the confusion of concerns about the OPERATIONAL HAZARDS of research on DNA --namely the possibility of accidental dissemination of new pathogens -- with the imputed DANGERS OF NEW KNOWLEDGE. I hope that the conference will not further add to that confusion, and indeed that it will be sensitive to the far-reaching implications of providing support for the censorship of scientific thought (in distinction to the social control of technological applications.)

5. Finally, whatever principles may emerge from these discussions, I hope that careful attention will be given to the difficulties and unintended side effects of the ENFORCEMENT of such principles. The establishment of rigid rules that are unable to anticipate new opportunities, new insights, special circumstances in particular research programs, as well as new hazards, may be another major obstacle for further innovations not only in molecular genetics research overtly related to the theme of the conference, but for many other programs that may have the added burden of "proving their innocence" before being permitted to proceed. We have a precedent for this concern in current rules which require prior review of research that might involve human subjects well before grant-applications can even be submitted to the NIH. There are strains of contemporary ideology that are quite sympathetic to the concept of a socially ordered frame of control of scientific investigation, and are therefore quite congenial to the policing of research in this area as a precedent.The zeal with which the moratorium was pressed prior to this meeting by some of its proponents illustrates this ideology. I hope the Conference will be careful to separate such dogmas from the assessment of specific public risks and benefits that are its responsible agenda. And I will confess my own biasses that while Science must be careful to respond to social needs in the

development and application of new technology, and of course to exercise the utmost prudence in its operations as they may affect personal rights and the public safety, that Science is in grave danger of losing its INTELLECTUAL autonomy if the pursuit of certain kinds of knowledge is judged to be illegitimate.

17-MAR-75

In a story in the Times for Febr. 28, I was quoted as having been in partial dissent from the conference on Genetic Engineering at Asilomar, Calif.,i.e., that I "regarded the safeguards as virtually unenforceable because of the difficulty of determining exactly the risk of specific experiments." The subject of the conference and the implications of its conclusions are both extremely complex, and it would be easy and mischievous to oversimplify them; and the consequences for the progress of scientific research might then be very serious.Therefore I am bound to say that my view is almost the opposite of what was asserted. My chief concern at the Conference was that a set of precautions that are entirely appropriate for certain risks might be prematurely rigidified into a set of bureaucratic regulations that might be very readily enforced beyond the domain of their reasonable application. I am wholeheartedly in support of the spirit and intentions of the Conference Report, but was unwilling to put my name to a document that left many important questions for future determination, and whose tone seemed to invite the bureucratic rigidity just mentioned. I was simply less optimistic than many of my colleagues that we would have further opportunities to communicate the detail of a responsive set of regulations that would reflect more precisely than does the actual text of the provisional report the actual technical consensus of the group, which was indeed of a high order.

Joshua Lederberg
Professor of Genetics